SPATIAL AND TEMPORAL DISPERSAL AND RECRUITMENT PATTERNS OF DECAPOD CRUSTACEA IN THE NORTHWESTERN ATLANTIC

Larval dispersal and postlarval recruitment are vital processes affecting the maintenance of ecologically and economically significant populations of decapod crustaceans. Vertical positioning of larvae and postlarvae in the water column plays a major role in the particular strategies of retention or expulsion with immigration that are employed.

The present study was undertaken to investigate variations in vertical distribution of prejuvenile decapod crustaceans according to temporal (diel), spatial (estuarine, transitional, oceanic), ontogenetic (larval stages, postlarvae) and various environmental factors (light, temperature, salinity, wind, tidal cycles). Furthermore, effects of vertical positioning on dispersal and recruitment were examined.

Three stations were established for the present study: York River mouth (estuarine) (37°12'N, 76°16'W); Chesapeake Bay mouth (transitional) (36°58'N, 76°07'W); Chesapeake Light Tower (offshore) (35°54'N, 75°43'W). Each station was occupied for a continuous 72 hour period in late summer over six tidal cycles. Quantitative plankton samples were collected every three hours from the following depths: Neuston (0.1 m), 1m, 3m, 6m, epibenthos (11–13 m). A total of 375 samples were obtained (125 from each station). Non-parametric methods of statistical analysis were used, except where normality was not critical.

Collectively, 41 decapod species, 160 developmental stages and an estimated 6,000,000 specimens were obtained. A large majority of the total catch (86%) came from the offshore location. True crabs (Brachyura) accounted for 53% of the species, 50% of the stages and 92% of the specimens. Anomurans, thalassinideans and shrimps were also found. *Callinectes sapidus* (87% of the total), *Uca* spp. (3%) and *Panopeus chaetopterana* (2%) were the most commonly collected species.

Of the 160 developmental stages, 56 were present in sufficient quantities for data analysis (Maris, 1986). Fifteen different distributional groups were formed based on statistical comparisons of abundances with depth.

Results indicated that proximity to the estuary greatly affects vertical positioning. Overall day-night mean depths (m) for collective specimens were: estuarine, 5.96–4.24; transitional, 7.49–3.19; offshore, 1.86–1.41. Light was proposed as the major factor governing distribution, with temperature, salinity and tidal cycles having no significant effects.

Six dispersal-recruitment patterns were established for collected genera based on temporal and spatial distributions: retained estuarine (*Neopanope, Palaemonetes, Panopeus*), retained estuarine-transitional (*Callinassa, Panuxa, Pinnotheres, Upogebia*), retained transitional-nearshore (*Euceramus, Hexapanopeus, Pagurus*), retained offshore (*Emerita, Libinia, Ovalipes*), expelled with estuarine spawning (*Uca*) and expelled with transitional spawning (*Callinectes*).

Vertical positioning greatly influences larval dispersal and postlarval recruitment of decapod crustaceans. Certain estuarine and transitional species accomplish retention by consistently maintaining a vertical location near the bottom, while some vertically migrate over short intermediate distances, presumably to the depth of no net motion. Others maintain constant intermediate depths, while various species vertically migrate over long distances. Offshore, individuals are typically retained on the continental shelf by maintaining shallow-intermediate depths.

Larval abundance correlations with ebb tides (promoting flushing) and flood tides (promoting retention) in small inlets have been presented by Cronin and Forward (1982), Lambert and Epifanio (1982), and Brookins and Epifanio (1985). In the present study, the general lack of correlation between tidal influence and vertical distribution possibly indicates that different mechanisms are in effect in large systems as compared to small inlets.

Even though tidal effects were found to be minimal, larvae likely utilise the net flow patterns of the bilayered system for movement. Transport mechanisms typically consist of near-bottom estuarine concentrations with upper layer affinities maintained offshore.

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Robert C. Maris, Department of Biology, Mansfield University of Pennsylvania, Mansfield, PA 16933, USA.